CLAIMS

[C1] 1. A reactor module comprising an assembly of one or more than one heat exchanger, a chamber block capable of being charged with a catalyst, and a platform

the chamber block having an inlet for the introduction of reactants therein and an outlet for the exit of reactant products therefrom and one or more one than one longitudinal cavity extending therethrough from the inlet to the outlet;

the one or more than one heat exchanger being aligned with the chamber block, said one or more than one heat exchanger having first and second opposite sides with micro channel pathways for fluid flow on each side, each heat exchanger having an inlet and an outlet in communication with the pathways on each opposite side thereof;

the platform securing the one or more than one heat exchanger and the chamber block in alignment, the platform defining a closed interior pathway operatively disposed to communicate with the inlet of the one or more than one cavity in the chamber block.

[C2] 2. The reactor of claim 1 in which the platform includes a plate spaced apart from the inlet of the one or more than one cavity in the chamber block to form a fluid flow channel in communication with the one or more than one cavity.

[C3] 3. The reactor of claim 2 in which the platform is "U" shaped and in which opposite sides of the "U" include orifices in operative correspondence with an inlet and an outlet of a heat exchanger.

[C4] 4. The reactor of claim 3 in which orifices in the opposite sides of the "U" are formed in the extending legs of the "U" in a direction transverse to the extending legs.

[C5] 5. The reactor of claim 3 including a chamber block disposed in contact with the one or more than one heat exchanger in a relationship in which an outlet of the one or more than one heat exchanger is in communication with an inlet of the one or more than one cavity in the chamber block.

[C6] 6. The reactor of claim 5 including sides which form a polyhedron open on the side corresponding to a plane formed by an outlet of the one or more than one cavity.

[C7] 7. The reactor of claim 6 including an exhaust cover over the open side of the polyhedron.

[C8] 8. The reactor of claim 7 including a frit disposed between the plane formed by an outlet of the one or more than one cavity and the exhaust cover.

[C9] 9. The reactor of claim 7 including a frit disposed between the plane formed by an inlet of the one or more than one cavity and the platform.

[C10] 10. The reactor of claim 1 in which the one or more than one cavity includes a catalyst.

[C11] 11. The reactor of claim 10 in which the catalyst is a powder, granule, pellet or extrudate.

[C12] 12. The reactor of claim 11 in which the nominal powder size is greater than 125 microns.

[C13] 13. The reactor of claim 11 including a granular catalyst having a size of about 450 microns.

[C14] 14. The reactor of claim 12 or claim 13 in which the catalyst is selected from one or more than one of the group of of mono-, bi-, and poly-metallic alloys and oxides of IIIB including rare earth metals and the noble metals, transition metal groups, alkali metal families IA, IIA and IVA and Sb, Te, Bi, and Se.

[C15] 15. The reactor of claim 6 in which the exhaust cover includes an opening in correspondence with an outlet of the one or more than one cavity.

[C16] 16. The reactor of claim 1 in which each of the one or more than one cavity has a diameter of at least 1 centimeter.

[C17] 17. The reactor of claim 1 in which each of the one or more than one cavity has a length of less than 2.5 centimeters.

[C18] 18. The reactor of claim 1 in which the length of each of the one or more than one cavity corresponds to the length of the chamber block.

[C19] 19. The reactor of claim 1 including a plurality of cavities in a row by column arrangement.

[C20] 20. The reactor of claim 19 in which the number of rows equals the number of columns.

[C21] 21. The reactor of claim 1 including a plurality of cavities in a staggered arrangement.

[C22] 22. The reactor of claim 7 in which the exhaust cover comprises a continuous single exit manifold interconnected with each of the one or more than one cavity outlet.

[C23] 23. The reactor of claim 1 further providing a reaction temperature in the range of 250 degrees Celsius to 650 degrees Celsius.

[C24] 24. The reactor of claim 1 in which each of the one or more than one cavity in chamber block receives reactants at a predetermined pressure.

[C25] 25. The reactor of claim 1 in which the one or more than one cavity receives the reactants at a pressure of less than 3 atmospheres.

[C26] 26. The reactor of claim 1 configured as a unit with a capacity for use in a fuel cell system rated at 1.25 kW.

[C27] 27. The reactor of claim 1 configured as a unit with a capacity for use in a fuel cell system rated at .65 kW.

[C28] 28. A reactor module comprising one or more of the reactors of claim 25 or claim 26 connected in parallel such that the reactant products produced by each reactor are exhausted through a common exit.

[C29] 29. A large system reactor comprising a plurality of the reactor modules of claim 28 connected in parallel such that the reactant products produced by each reactor are exhausted through a common exit.

[C30] 30. A low temperature shift reactor in accordance with claim 1 in which the chamber block is charged with one or more than one catalyst selected from the group of Cu-Zn-Al, NM-CeOx, transition metal carbides and nitrides.

[C31] 31. A high temperature shift reactor in accordance with claim 1 in which the chamber block is charged with one or more than one of Fe-Cr-Al and CoMoAl.

[C32] 32. A reactor in accordance with claim 1 having one or more than one chamber charged with one or more than one catalyst from the group of mono-, bi- and poly- metallic alloys and oxides of Group IIIB including rare earth metals, Group IVB, Group VB, Group VIB, Group VIIB, Fe, Co, Ni, Cu, Zn, Cd, noble metals, transition metal groups, alkali metal families, Group IA and Group IIA, Group IIIA, Group IVA, Sb, Te, Bi and Se.